

HAWAII ADMINISTRATIVE RULES

TITLE 12

DEPARTMENT OF LABOR AND INDUSTRIAL RELATIONS

SUBTITLE 8

DIVISION OF OCCUPATIONAL SAFETY AND HEALTH

PART 8

HEALTH STANDARDS

CHAPTER 201

RADIATION HAZARDS

§12-201-1	Repealed
§12-201-1.1	Ionizing radiation
§12-201-2	Repealed
§12-201-2.1	Nonionizing radiation
§12-201-3	Lasers

Historical note: Chapter 201 of title 12 is based upon chapter 304 of the Hawaii Occupational Safety and Health Standards, Rules and Regulations. [Eff 7/11/74; am 12/30/76; am 8/22/77; am 8/11/78; R 7/12/82]

§12-201-1 REPEALED. [Eff 7/12/82; am 8/5/88; ren §12-201-1 and comp 6/8/92; R 11/16/96] (Auth: HRS §396-4) (Imp: HRS §396-4)

§12-201-1.1 Ionizing radiation. (a) Incorporation of federal standard. Title 29, Code of Federal Regulations, section 1910.96, entitled "Ionizing radiation", published by the Office of the Federal Register, National Archives and published on June 27, 1974, and the amendments published on October 24, 1978; November 7, 1978; April 30, 1984; June 30, 1993; June 20, 1996 (redesignated as §1910.1096), are made a part of this section, except as provided in subsection (b).

§1910.1096 Ionizing radiation.

(a) Definitions applicable to this section.

- (1) **Radiation** includes alpha rays, beta rays, gamma rays, X-rays, neutrons, high-speed electrons, high-speed protons, and other atomic particles; but such term does not include sound or radio waves, or visible light, or infrared or ultraviolet light.
- (2) **Radioactive material** means any material that emits, by spontaneous nuclear disintegration, corpuscular or electromagnetic emanations.
- (3) **Restricted area** means any area access to that is controlled by the employer for purposes of protection of individuals from exposure to radiation or radioactive materials.
- (4) **Unrestricted area** means any area access to that is not controlled by the employer for purposes of protection of individuals from exposure to radiation or radioactive materials.
- (5) **Dose** means the quantity of ionizing radiation absorbed, per unit of mass, by the body or by any portion of the body. When the provisions in this section specify a dose during a period of time, the dose is the total quantity of radiation absorbed, per unit of mass, by the body or by any portion of the body during such period of time. Several different units of dose are in current use. Definitions of units used in this section are set forth in paragraphs (a) (6) and (7) of this section.
- (6) **Rad** means a measure of the dose of any ionizing radiation to body tissues in terms of the energy absorbed per unit of mass of the tissue. One rad is the dose corresponding to the absorption of 100 ergs per gram of tissue (1 millirad (mrad)=0.001 rad).

- (7) **Rem** means a measure of the dose of any ionizing radiation to body tissue in terms of its estimated biological effect relative to a dose of 1 roentgen (r) of X-rays (1 millirem (mrem)=0.001 rem). The relation of the rem to other dose units depends upon the biological effect under consideration and upon the conditions for irradiation. Each of the following is considered to be equivalent to a dose of 1 rem:
- (i) A dose of 1 roentgen due to X- or gamma radiation;
 - (ii) A dose of 1 rad due to X-, gamma, or beta radiation;
 - (iii) A dose of 0.1 rad due to neutrons or high energy protons;
 - (iv) A dose of 0.05 rad due to particles heavier than protons and with sufficient energy to reach the lens of the eye;
 - (v) If it is more convenient to measure the neutron flux, or equivalent, than to determine the neutron dose in rads, as provided in paragraph (a)(7)(iii) of this section, 1 rem of neutron radiation may, for purposes of the provisions in this section be assumed to be equivalent to 14 million neutrons per square centimeter incident upon the body; or, if there is sufficient information to estimate with reasonable accuracy the approximate distribution in energy of the neutrons, the incident number of neutrons per square centimeter equivalent to 1 rem may be estimated from Table G-17:

TABLE G-17 - NEUTRON FLUX DOSE EQUIVALENTS

Neutron energy (million electron volts (Mev))	Number of neutrons per square centimeter equivalent to a dose of 1 rem (Neutrons/cm ²)	Average flux to deliver 100 millirem in 40 hours (neutrons/cm ² per sec)
Thermal.....	970 X 10 ⁶	670
0.0001.....	720 X 10 ⁶	500
0.005.....	820 X 10 ⁶	570
0.02.....	400 X 10 ⁶	280
0.1.....	120 X 10 ⁶	80
0.5.....	43 X 10 ⁶	30
1.0.....	26 X 10 ⁶	18
2.5.....	29 X 10 ⁶	20
5.0.....	26 X 10 ⁶	18
7.5.....	24 X 10 ⁶	17
10.....	24 X 10 ⁶	17
10 to 30.....	14 X 10 ⁶	10

- (8) For determining exposures to X- or gamma rays up to 3 Mev., the dose limits specified in this section may be assumed to be equivalent to the "air dose". For the purpose of this section air dose means that the dose is measured by a properly calibrated appropriate instrument in air at or near the body surface in the region of the highest dosage rate.
- (b) Exposure of individuals to radiation in restricted areas.
- (1) Except as provided in paragraph (b)(2) of this section, no employer shall possess, use, or transfer sources of ionizing radiation in such a manner as to cause any individual in a restricted area to receive in any period of one calendar quarter from sources in the employer's possession or control a dose in excess of the limits specified in Table G-18:

TABLE G-18

	Rems per calendar quarter
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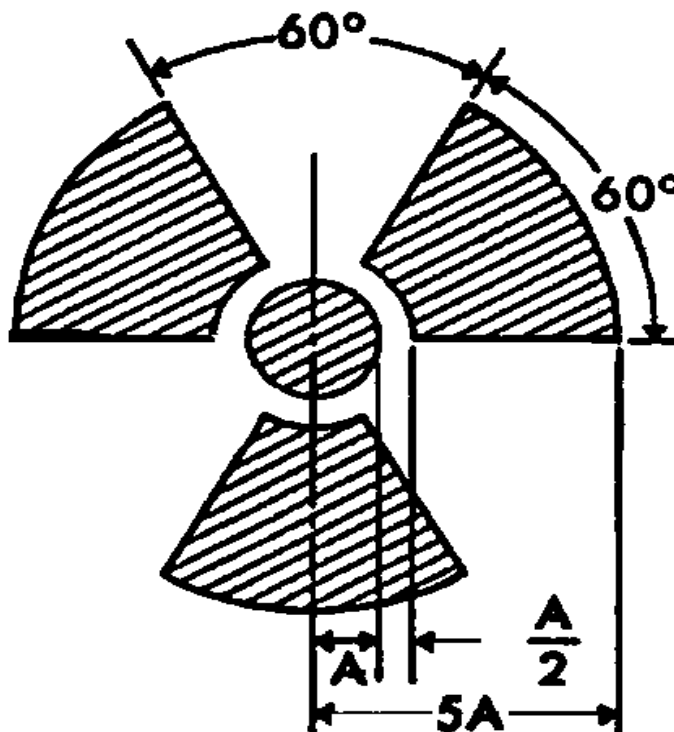
Whole body: Head and trunk; active blood-forming organs; lens of eyes; or gonads.....	1 1/4
Hands and forearms; feet and ankles.....	18 3/4
Skin of whole body.....	7 1/2

- (2) An employer may permit an individual in a restricted area to receive doses to the whole body greater than those permitted under subparagraph (1) of this paragraph, so long as:
- (i) During any calendar quarter the dose to the whole body shall not exceed 3 rems; and
 - (ii) The dose to the whole body, when added to the accumulated occupational dose to the whole body, shall not exceed 5 (N-18) rems, where "N" equals the individual's age in years at his last birthday; and
 - (iii) The employer maintains adequate past and current exposure records that show that the addition of such a dose will not cause the individual to exceed the amount authorized in this subparagraph. As used in this subparagraph Dose to the whole body shall be deemed to include any dose to the whole body, gonad, active bloodforming organs, head and trunk, or lens of the eye.
- (3) No employer shall permit any employee who is under 18 years of age to receive in any period of one calendar quarter a dose in excess of 10 percent of the limits specified in Table G-18.
- (4) Calendar quarter means any 3-month period determined as follows:
- (i) The first period of any year may begin on any date in January: Provided, That the second, third, and fourth periods accordingly begin on the same date in April, July, and October, respectively, and that the fourth period extends into January of the succeeding year, if necessary to complete a 3-month quarter. During the first year of use of this method of determination, the first period for that year shall also include any additional days in January preceding the starting date for the first period; or
 - (ii) The first period in a calendar year of 13 complete, consecutive calendar weeks; the second period in a calendar year of 13 complete, consecutive weeks; the third period in a calendar year of 13 complete, consecutive calendar weeks; the fourth period in a calendar year of 13 complete, consecutive calendar weeks. If at the end of a calendar year there are any days not falling within a complete calendar week of that year, such days shall be included within the last complete calendar week of that year. If at the beginning of any calendar year there are days not falling within a complete calendar week of that year, such days shall be included within the last complete calendar week of the previous year; or
 - (iii) The four periods in a calendar year may consist of the first 14 complete, consecutive calendar weeks; the next 12 complete, consecutive calendar weeks, the next 14 complete, consecutive calendar weeks, and the last 12 complete, consecutive calendar weeks. If at the end of a calendar year there are any days not falling within a complete calendar week of that year, such days shall be included (for purposes of this section) within the last complete calendar week of the year. If at the beginning of any calendar year there are days not falling within a complete calendar week of that year, such days shall be included (for purposes of this section) within the last complete week of the previous year.
- (c) Exposure to airborne radioactive material.
- (1) No employer shall possess, use or transport radioactive material in such a manner as to cause any employee, within a restricted area, to be exposed to airborne radioactive material in an average concentration in excess of the limits specified in Table 1 of Appendix B to 10 CFR Part 20. The limits given in Table 1 are for exposure to the concentrations specified for 40 hours in any workweek of 7 consecutive days. In any such period where the number of hours of exposure is less than 40, the limits specified in the table may be increased proportionately. In any such period where the number of hours of exposure is greater than 40, the limits specified in the table shall be decreased proportionately.
 - (2) No employer shall possess, use, or transfer radioactive material in such a manner as to cause any individual within a restricted area, who is under 18 years of age, to be exposed to airborne radioactive material in an average concentration in excess of the limits specified in Table II of Appendix B to 10 CFR Part 20. For purposes of this paragraph, concentrations may be averaged over periods not greater than 1 week.

- (3) Exposed as used in this paragraph means that the individual is present in an airborne concentration. No allowance shall be made for the use of protective clothing or equipment, or particle size.
- (d) Precautionary procedures and personal monitoring.**
- (1) Every employer shall make such surveys as may be necessary for him to comply with the provisions in this section. Survey means an evaluation of the radiation hazards incident to the production, use, release, disposal, or presence of radioactive materials or other sources of radiation under a specific set of conditions. When appropriate, such evaluation includes a physical survey of the location of materials and equipment, and measurements of levels of radiation or concentrations of radioactive material present.
 - (2) Every employer shall supply appropriate personnel monitoring equipment, such as film badges, pocket chambers, pocket dosimeters, or film rings, and shall require the use of such equipment by:
 - (i) Each employee who enters a restricted area under such circumstances that he receives, or is likely to receive, a dose in any calendar quarter in excess of 25 percent of the applicable value specified in paragraph (b)(1) of this section; and
 - (ii) Each employee under 18 years of age who enters a restricted area under such circumstances that he receives, or is likely to receive, a dose in any calendar quarter in excess of 5 percent of the applicable value specified in paragraph (b)(1) of this section; and
 - (iii) Each employee who enters a high radiation area.
 - (3) As used in this section:
 - (i) Personnel monitoring equipment means devices designed to be worn or carried by an individual for the purpose of measuring the dose received (e.g., film badges, pocket chambers, pocket dosimeters, film rings, etc.);
 - (ii) Radiation area means any area, accessible to personnel, in that there exists radiation at such levels that a major portion of the body could receive in any 1 hour a dose in excess of 5 millirem, or in any 5 consecutive days a dose in excess of 100 millirem; and
 - (iii) High radiation area means any area, accessible to personnel, in that there exists radiation at such levels that a major portion of the body could receive in any one hour a dose in excess of 100 millirem.
- (e) Caution signs, labels, and signals.**
- (1) General.
 - (i) Symbols prescribed by this paragraph shall use the conventional radiation caution colors (magenta or purple on yellow background). The symbol prescribed by this paragraph is the conventional three-bladed design:

FIGURE G-10. RADIATION SYMBOL

2. Background is to be yellow.



- (2) Radiation area. Each radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol described in subparagraph (1) of this paragraph and the words:

**CAUTION
RADIATION AREA**

- (3) High radiation area.
(i) Each high radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

**CAUTION
HIGH RADIATION AREA**

- (ii) Each high radiation area shall be equipped with a control device that shall either cause the level of radiation to be reduced below that at that an individual might receive a dose of 100 millirems in 1 hour upon entry into the area or shall energize a conspicuous visible or audible alarm signal in such a manner that the individual entering and the employer or a supervisor of the activity are made aware of the entry. In the case of a high radiation area established for a period of 30 days or less, such control device is not required.
- (4) Airborne radioactivity area.
(i) As used in the provisions of this section, airborne radioactivity area means:
(a) Any room, enclosure, or operating area in that airborne radioactive materials, composed wholly or partly of radioactive material, exist in concentrations in excess of the amounts specified in column 1 of Table 1 of Appendix B to 10 CFR Part 20 or

- (b) Any room, enclosure, or operating area in that airborne radioactive materials exist in concentrations that, averaged over the number of hours in any week during that individuals are in the area, exceed 25 percent of the amounts specified in column 1 of Table 1 of Appendix B to 10 CFR Part 20.
- (ii) Each airborne radioactivity area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol described in paragraph (e)(1) of this section and the words:

**CAUTION
AIRBORNE RADIOACTIVITY AREA**

- (5) Additional requirements.
 - (i) Each area or room in that radioactive material is used or stored and that contains any radioactive material (other than natural uranium or thorium) in any amount exceeding 10 times the quantity of such material specified in Appendix C to 10 CFR Part 20 shall be conspicuously posted with a sign or signs bearing the radiation caution symbol described in paragraph (e)(1) of this section and the words:

**CAUTION
RADIOACTIVE MATERIALS**

- (ii) Each area or room in that natural uranium or thorium is used or stored in an amount exceeding 100 times the quantity of such material specified in 10 CFR Part 20 shall be conspicuously posted with a sign or signs bearing the radiation caution symbol described in paragraph (e)(1) of this section and the words:

**CAUTION
RADIOACTIVE MATERIALS**

- (6) Containers.
 - (i) Each container in that is transported, stored, or used a quantity of any radioactive material (other than natural uranium or thorium) greater than the quantity of such material specified in Appendix C to 10 CFR Part 20 shall bear a durable, clearly visible label bearing the radiation caution symbol described in paragraph (e)(1) of this section and the words:

**CAUTION
RADIOACTIVE MATERIALS**

- (ii) Each container in that natural uranium or thorium is transported, stored, or used in a quantity greater than 10 times the quantity specified in Appendix C to 10 CFR Part 20 shall bear a durable, clearly visible label bearing the radiation caution symbol described in paragraph (e)(1) of this section and the words:

**CAUTION
RADIOACTIVE MATERIALS**

- (iii) Notwithstanding the provisions of paragraphs (e)(6) (i) and (ii) of this section a label shall not be required:
 - (a) If the concentration of the material in the container does not exceed that specified in column 2 of Table 1 of Appendix B to 10 CFR Part 20, or
 - (b) For laboratory containers, such as beakers, flasks, and test tubes, used transiently in laboratory procedures, when the user is present.
- (iv) Where containers are used for storage, the labels required in this subparagraph shall state also the quantities and kinds of radioactive materials in the containers and the date of measurement of the quantities.
- (f) Immediate evacuation warning signal.
 - (1) Signal characteristics.

- (i) The signal shall be a midfrequency complex sound wave amplitude modulated at a subsonic frequency. The complex sound wave in free space shall have a fundamental frequency (f_1) between 450 and 500 hertz (Hz) modulated at a subsonic rate between 4 and 5 hertz.
 - (ii) The signal generator shall not be less than 75 decibels at every location where an individual may be present whose immediate, rapid, and complete evacuation is essential.
 - (iii) A sufficient number of signal units shall be installed such that the requirements of paragraph (f)(1)(ii) of this section are met at every location where an individual may be present whose immediate, rapid, and complete evacuation is essential.
 - (iv) The signal shall be unique in the plant or facility in that it is installed.
 - (v) The minimum duration of the signal shall be sufficient to insure that all affected persons hear the signal.
 - (vi) The signal-generating system shall respond automatically to an initiating event without requiring any human action to sound the signal.
- (2) Design objectives.
- (i) The signal-generating system shall be designed to incorporate components that enable the system to produce the desired signal each time it is activated within one-half second of activation.
 - (ii) The signal-generating system shall be provided with an automatically activated secondary power supply that is adequate to simultaneously power all emergency equipment to that it is connected, if operation during power failure is necessary, except in those systems using batteries as the primary source of power.
 - (iii) All components of the signal-generating system shall be located to provide maximum practicable protection against damage in case of fire, explosion, corrosive atmosphere, or other environmental extremes consistent with adequate system performance.
 - (iv) The signal-generating system shall be designed with the minimum number of components necessary to make it function as intended, and should utilize components that do not require frequent servicing such as lubrication or cleaning.
 - (v) Where several activating devices feed activating information to a central signal generator, failure of any activating device shall not render the signal-generator system inoperable to activating information from the remaining devices.
 - (vi) The signal-generating system shall be designed to enhance the probability that alarm occurs only when immediate evacuation is warranted. The number of false alarms shall not be so great that the signal will come to be disregarded and shall be low enough to minimize personal injuries or excessive property damage that might result from such evacuation.
- (3) Testing.
- (i) Initial tests, inspections, and checks of the signal-generating system shall be made to verify that the fabrication and installation were made in accordance with design plans and specifications and to develop a thorough knowledge of the performance of the system and all components under normal and hostile conditions.
 - (ii) Once the system has been placed in service, periodic tests, inspections, and checks shall be made to minimize the possibility of malfunction.
 - (iii) Following significant alterations or revisions to the system, tests and checks similar to the initial installation tests shall be made.
 - (iv) Tests shall be designed to minimize hazards while conducting the tests.
 - (v) Prior to normal operation the signal-generating system shall be checked physically and functionally to assure reliability and to demonstrate accuracy and performance. Specific tests shall include:
 - (a) All power sources.
 - (b) Calibration and calibration stability.
 - (c) Trip levels and stability.
 - (d) Continuity of function with loss and return of required services such as AC or DC power, air pressure, etc.
 - (e) All indicators.
 - (f) Trouble indicator circuits and signals, where used.
 - (g) Air pressure (if used)
 - (h) Determine that sound level of the signal is within the limit of paragraph (f)(1)(ii) of this section at all points that require immediate evacuation.

- (vi) In addition to the initial startup and operating tests, periodic scheduled performance tests and status checks must be made to insure that the system is at all times operating within design limits and capable of the required response. Specific periodic tests or checks or both shall include:
 - (a) Adequacy of signal activation device.
 - (b) All power sources.
 - (c) Function of all alarm circuits and trouble indicator circuits including trip levels.
 - (d) Air pressure (if used).
 - (e) Function of entire system including operation without power where required.
 - (f) Complete operational tests including sounding of the signal and determination that sound levels are adequate.
- (vii) Periodic tests shall be scheduled on the basis of need, experience, difficulty, and disruption of operations. The entire system should be operationally tested at least quarterly.
- (viii) All employees whose work may necessitate their presence in an area covered by the signal shall be made familiar with the actual sound of the signal-preferably as it sounds at their work location. Before placing the system into operation, all employees normally working in the area shall be made acquainted with the signal by actual demonstration at their work locations.
- (g) Exceptions from posting requirements. Notwithstanding the provisions of paragraph (e) of this section:
 - (1) A room or area is not required to be posted with a caution sign because of the presence of a sealed source, provided the radiation level 12 inches from the surface of the source container or housing does not exceed 5 millirem per hour.
 - (2) Rooms or other areas in onsite medical facilities are not required to be posted with caution signs because of the presence of patients containing radioactive material, provided that there are personnel in attendance who shall take the precautions necessary to prevent the exposure of any individual to radiation or radioactive material in excess of the limits established in the provisions of this section.
 - (3) Caution signs are not required to be posted at areas or rooms containing radioactive materials for periods of less than 8 hours: Provided, That
 - (i) The materials are constantly attended during such periods by an individual who shall take the precautions necessary to prevent the exposure of any individual to radiation or radioactive materials in excess of the limits established in the provisions of this section; and
 - (ii) Such area or room is subject to the employer's control.
- (h) Exemptions for radioactive materials packaged for shipment. Radioactive materials packaged and labeled in accordance with regulations of the Department of Transportation published in 49 CFR Chapter I, are exempt from the labeling and posting requirements of this subpart during shipment, provided that the inside containers are labeled in accordance with the provisions of paragraph (e) of this section.
- (i) Instruction of personnel, posting.
 - (1) Employers regulated by the Nuclear Regulatory Commission shall be governed by 10 CFR Part 20 standards. Employers in a State named in paragraph (p)(3) of this section shall be governed by the requirements of the laws and regulations of that State. All other employers shall be regulated by the following:
 - (2) All individuals working in or frequenting any portion of a radiation area shall be informed of the occurrence of radioactive materials or of radiation in such portions of the radiation area; shall be instructed in the safety problems associated with exposure to such materials or radiation and in precautions or devices to minimize exposure; shall be instructed in the applicable provisions of this section for the protection of employees from exposure to radiation or radioactive materials; and shall be advised of reports of radiation exposure that employees may request pursuant to the regulations in this section.
 - (3) Each employer to whom this section applies shall post a current copy of its provisions and a copy of the operating procedures applicable to the work conspicuously in such locations as to insure that employees working in or frequenting radiation areas will observe these documents on the way to and from their place of employment, or shall keep such documents available for examination of employees upon request.
- (j) Storage of radioactive materials. Radioactive materials stored in a non-radiation area shall be secured against unauthorized removal from the place of storage.

- (k) Waste disposal. No employer shall dispose of radioactive material except by transfer to an authorized recipient, or in a manner approved by the Nuclear Regulatory Commission or a State named in paragraph (p)(3) of this section.
- (l) Notification of incidents.
 - (1) Immediate notification. Each employer shall immediately notify the Assistant Secretary of Labor or his duly authorized representative, for employees not protected by the Nuclear Regulatory Commission by means of 10 CFR Part 20; paragraph (p)(2) of this section, or the requirements of the laws and regulations of States named in paragraph (p)(3) of this section, by telephone or telegraph of any incident involving radiation that may have caused or threatens to cause:
 - (i) Exposure of the whole body of any individual to 25 rems or more of radiation; exposure of the skin of the whole body of any individual to 150 rems or more of radiation; or exposure of the feet, ankles, hands, or forearms of any individual to 375 rems or more of radiation; or
 - (ii) The release of radioactive material in concentrations that, if averaged over a period of 24 hours, would exceed 5,000 times the limit specified for such materials in Table II of Appendix B to 10 CFR Part 20.
 - (2) Twenty-four hour notification. Each employer shall within 24 hours following its occurrence notify the Assistant Secretary of Labor or his duly authorized representative for employees not protected by the Nuclear Regulatory Commission by means of 10 CFR Part 20; paragraph (p)(2) of this section, or the requirements of the laws and applicable regulations of States named in paragraph (p)(3) of this section, by telephone or telegraph of any incident involving radiation that may have caused or threatens to cause:
 - (i) Exposure of the whole body of any individual to 5 rems or more of radiation; exposure of the skin of the whole body of any individual to 30 rems or more of radiation; or exposure of the feet, ankles, hands, or forearms to 75 rems or more of radiation; or
- (m) Reports of overexposure and excessive levels and concentrations.
 - (1) In addition to any notification required by paragraph (1) of this section each employer shall make a report in writing within 30 days to the Assistant Secretary of Labor or his duly authorized representative, for employees not protected by the Nuclear Regulatory Commission by means of 10 CFR Part 20; or under paragraph (p)(2) of this section, or the requirements of the laws and regulations of States named in paragraph (p)(3) of this section, of each exposure of an individual to radiation or concentrations of radioactive material in excess of any applicable limit in this section. Each report required under this paragraph shall describe the extent of exposure of persons to radiation or to radioactive material; levels of radiation and concentration of radioactive material involved, the cause of the exposure, levels of concentrations; and corrective steps taken or planned to assure against a recurrence.
 - (2) In any case where an employer is required pursuant to the provisions of this paragraph to report to the U.S. Department of Labor any exposure of an individual to radiation or to concentrations of radioactive material, the employer shall also notify such individual of the nature and extent of exposure. Such notice shall be in writing and shall contain the following statement: "You should preserve this report for future reference."
- (n) Records.
 - (1) Every employer shall maintain records of the radiation exposure of all employees for whom personnel monitoring is required under paragraph (d) of this section and advise each of his employees of his individual exposure on at least an annual basis.
 - (2) Every employer shall maintain records in the same units used in tables in paragraph (b) of this section and Appendix B to 10 CFR Part 20.
- (o) Disclosure to former employee of individual employee's record.
 - (1) At the request of a former employee an employer shall furnish to the employee a report of the employee's exposure to radiation as shown in records maintained by the employer pursuant to paragraph (n)(1) of this section. Such report shall be furnished within 30 days from the time the request is made, and shall cover each calendar quarter of the individual's employment involving exposure to radiation or such lesser period as may be requested by the employee. The report shall also include the results of any calculations and analysis of radioactive material deposited in the body of the employee. The report shall be in writing and contain the following statement: "You should preserve this report for future reference."
- (p) Nuclear Regulatory Commission licensees - NRC contractors operating NRC plants and facilities - NRC Agreement State licensees or registrants.

- (1) Any employer who possesses or uses source material, byproduct material, or special nuclear material, as defined in the Atomic Energy Act of 1954, as amended, under a license issued by the Nuclear Regulatory Commission and in accordance with the requirements of 10 CFR Part 20 shall be deemed to be in compliance with the requirements of this section with respect to such possession and use.
- (2) NRC contractors operating NRC plants and facilities: Any employer who possesses or uses source material, byproduct material, special nuclear material, or other radiation sources under a contract with the Nuclear Regulatory Commission for the operation of NRC plants and facilities and in accordance with the standards, procedures, and other requirements for radiation protection established by the Commission for such contract pursuant to the Atomic Energy Act of 1954 as amended (42 U.S.C. 2011 et seq.), shall be deemed to be in compliance with the requirements of this section with respect to such possession and use.
- (3) NRC-agreement State licensees or registrants:
 - (i) Atomic Energy Act sources. Any employer who possesses or uses source material, byproduct material, or special nuclear material, as defined in the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.), and has either registered such sources with, or is operating under a license issued by, a State that has an agreement in effect with the Nuclear Regulatory Commission pursuant to section 274(b) (42 U.S.C. 2021(b)) of the Atomic Energy Act of 1954, as amended, and in accordance with the requirements of that State's laws and regulations shall be deemed to be in compliance with the radiation requirements of this section, insofar as his possession and use of such material is concerned, unless the Secretary of Labor, after conference with the Nuclear Regulatory Commission, shall determine that the State's program for control of these radiation sources is incompatible with the requirements of this section. Such agreements currently are in effect only in the States of Alabama, Arkansas, California, Kansas, Kentucky, Florida, Mississippi, New Hampshire, New York, North Carolina, Texas, Tennessee, Oregon, Idaho, Arizona, Colorado, Louisiana, Nebraska, Washington, Maryland, North Dakota, South Carolina, and Georgia.
 - (ii) Other sources. Any employer who possesses or uses radiation sources other than source material, byproduct material, or special nuclear material, as defined in the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.), and has either registered such sources with, or is operating under a license issued by a State that has an agreement in effect with the Nuclear Regulatory Commission pursuant to section 274(b) (42 U.S.C. 2021(b)) of the Atomic Energy Act of 1954, as amended, and in accordance with the requirements of that State's laws and regulations shall be deemed to be in compliance with the radiation requirements of this section, insofar as his possession and use of such material is concerned, provided the State's program for control of these radiation sources is the subject of a currently effective determination by the Assistant Secretary of Labor that such program is compatible with the requirements of this section. Such determinations currently are in effect only in the States of Alabama, Arkansas, California, Kansas, Kentucky, Florida, Mississippi, New Hampshire, New York, North Carolina, Texas, Tennessee, Oregon, Idaho, Arizona, Colorado, Louisiana, Nebraska, Washington, Maryland, North Dakota, South Carolina, and Georgia.

(b) Definitions.

"Assistant Secretary of Labor" means the director of the department of labor and industrial relations or the director's designee. [Eff 11/16/96]
 (Auth: HRS §396-4) (Imp: HRS §396-4)

Historical note: Section 12-201-1.1 is based substantiailly upon section 12-201-1. [Eff 7/12/82; am 8/5/88; ren §12-201-1 and comp 6/8/92; R 11/16/96] (Auth: HRS §396-4) (Imp: HRS §396-4)

§12-201-2.1 Nonionizing radiation. Incorporation of federal standard.

Title 29, Code of Federal Regulations, section 1910.97, entitled "Nonionizing radiation" published by the Office of the Federal Register, National Archives and Records Administration, on June 27, 1974; and the amendments published on March 7, 1996, are made part of this chapter.
 [Eff 12/29/01] (Auth: HRS §396-4) (Imp: HRS §396-4)

Historical note: Section 12-201-2.1 is based substantially upon

12-201-2 [Eff 7/12/82; am 8/5/88; ren 12-201-2 and comp 6/8/92; R 12/29/01]

§1910.97 Nonionizing radiation.

(a) Electromagnetic radiation

(1) Definitions applicable to this paragraph.

- (i) The term **electromagnetic radiation** is restricted to that portion of the spectrum commonly defined as the radio frequency region, that for the purpose of this specification shall include the microwave frequency region.
- (ii) **Partial body irradiation.** Pertains to the case in that part of the body is exposed to the incident electromagnetic energy.
- (iii) **Radiation protection guide.** Radiation level that should not be exceeded without careful consideration of the reasons for doing so.
- (iv) The word **symbol** as used in this specification refers to the overall design, shape, and coloring of the rf radiation sign shown in figure G-11.
- (v) **Whole body irradiation.** Pertains to the case in that the entire body is exposed to the incident electromagnetic energy or in that the cross section of the body is smaller than the cross section of the incident radiation beam.

(2) Radiation protection guide.

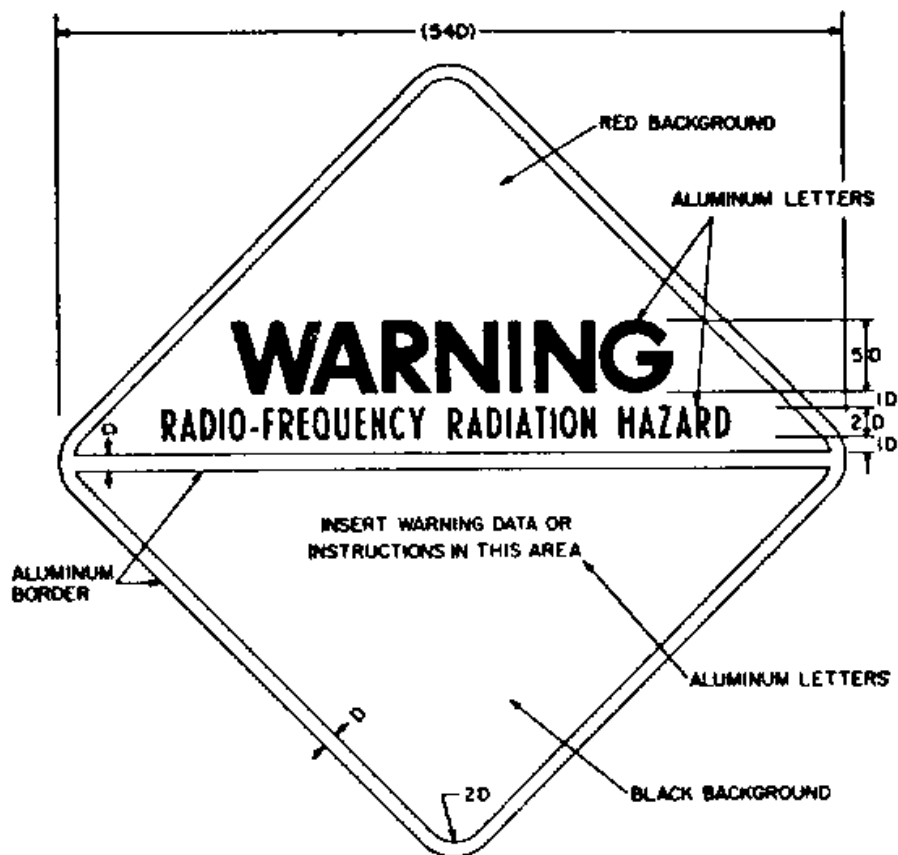
- (i) For normal environmental conditions and for incident electromagnetic energy of frequencies from 10 MHz to 100 GHz, the radiation protection guide is 10 mW/cm.(2) (milliwatt per square centimeter) as averaged over any possible 0.1-hour period. This means the following:
 Power density: 10 mW./cm.(2) for periods of 0.1-hour or more.
 Energy density: 1 mW.-hr./cm.(2) (milliwatt hour per square centimeter) during any 0.1-hour period.

This guide applies whether the radiation is continuous or intermittent.

- (ii) These formulated recommendations pertain to both whole body irradiation and partial body irradiation. Partial body irradiation must be included since it has been shown that some parts of the human body (e.g., eyes, testicles) may be harmed if exposed to incident radiation levels significantly in excess of the recommended levels.

(3) Warning symbol.

- (i) The warning symbol for radio frequency radiation hazards shall consist of a red isosceles triangle above an inverted black isosceles triangle, separated and outlined by an aluminum color border. The words "Warning - Radio-Frequency Radiation Hazard" shall appear in the upper triangle. See figure G-11.
- (ii) American National Standard Safety Color Code for Marking Physical Hazards and the Identification of Certain Equipment, Z53.1-1953 that is incorporated by reference as specified in Sec. 1910.6, shall be used for color specification. All lettering and the border shall be of aluminum color.
- (iii) The inclusion and choice of warning information or precautionary instructions is at the discretion of the user. If such information is included it shall appear in the lower triangle of the warning symbol.



1. Place handling and mounting instructions on reverse side.
2. D = Scaling unit.
3. Lettering: Ratio of letter height to thickness of letter lines.

Upper triangle :	5 to 1	Large
	6 to 1	Medium
Lower triangle	4 to 1	Small
	6 to 1	Medium
4. Symbol is square, triangles are right-angle isoseles.

Figure G-11

Radio-Frequency Radiation Hazard Warning Symbol

- (4) **Scope.** This section applies to all radiations originating from radio stations, radar equipment, and other possible sources of electromagnetic radiation such as used for communication, radio navigation, and industrial and scientific purposes. This section does not apply to the deliberate exposure of patients by, or under the direction of, practitioners of the healing arts.

- §12-201-3 Lasers.** (a) Only qualified and trained employees shall be assigned to install, adjust, and operate laser equipment.
- (b) Proof of qualification of the laser equipment operator shall be available and in possession of operator at all times.
 - (c) Employees, when working in areas in that a potential exposure to direct or reflected laser light greater than 0.005 watts (5 milliwatts) exists, shall be provided with antilaser eye protection devices.
 - (d) Areas in that lasers are used shall be posted with standard laser warning placards.
 - (e) Beam shutters or caps shall be utilized, or the laser turned off, when laser transmission is not actually required. When the laser is left unattended for a substantial period of time, such as during lunch hour, overnight or at change of shifts, the laser shall be turned off.
 - (f) Only mechanical or electrical means shall be used as a detector for guiding the internal alignment of the laser.
 - (g) The laser beam shall not be directed at employees.
 - (h) When it is raining or snowing, or when there is dust or fog in the air, the operator of laser systems shall be prohibited where practicable; in any event, employees shall be kept out of range of the area of source and target during those weather conditions.
 - (i) Laser equipment shall bear a label to indicate maximum output.
 - (j) Employees shall not be exposed to light intensities above:
 - (1) Direct staring: . . . 1 micro-watt per square centimeter;
 - (2) Incidental observing: . . . 1 milliwatt per square centimeter; and
 - (3) Diffused reflected light: . . . 2-1/2 watts per square centimeter.
 - (k) Laser unit in operation should be set up above the heads of the employees, when possible. [Eff 7/12/82; am 8/5/88; ren §12-201-3 and comp 6/8/92] (Auth: HRS §396-4) (Imp: HRS §396-4)